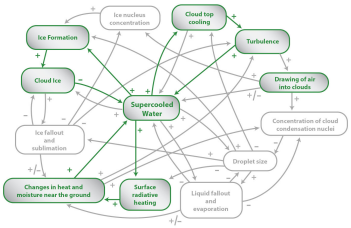
The Complexity of Arctic Clouds

Research Highlight

Scientists refer to clouds containing both ice and supercooled water as “mixed-phase” clouds. In the Arctic, these clouds occur frequently during all seasons and can persist for many days at a time. This persistence is remarkable given the inherent instability of ice-liquid mixtures. How is this possible?

Scientists have identified complex buffering processes that allow mixed-phase clouds to persist in the Arctic long after they would have dissipated in other environments. These processes, including the formation and growth of cloud droplets, limited cloud ice formation, movement of radiation through the tops of clouds, turbulence, and possible contributions from heat and moisture changes near the ground, all participate in an interconnected web of interactions that support the resilience of mixed-phase clouds.

The ability to identify and characterize complex interactions that influence the formation and life cycle of mixed-phase clouds is critical to improve the accuracy of computer models that predict future climate. This is especially true for the Arctic, which is particularly sensitive to climate change. Mixed-phase clouds play a critical role in modulating Arctic energy flow. As little as a 5% shift in the frequency of occurrence between these clouds and clear conditions could have a profound influence on important Arctic climate indicators, including sea-ice concentration, freshwater runoff, and productivity and diversity in marine and terrestrial environments.



Arctic climate feedbacks: The processes that allow mixed-phased clouds to persist in the Arctic are surprisingly complex and could impact the accuracy of climate models.

Reference(s)

Morrison H, G de Boer, G Feingold, J Harrington, M Shupe, and K Sulia. 2011. "Resilience of persistent Arctic mixed-phase clouds." Nature Geoscience, 5, doi:10.1038/ngeo1332.

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Cloud Life Cycle